WATER SUPPLY DEVELOPMENT VS. RIVER PROTECTION:
THE CASE FOR WATER CONSERVATION.

Prepared by: Russell Cohen, Rivers Advocate, Riverways Program, Mass. Department of Fisheries, Wildlife and Environmental Law Enforcement. Date: January 29, 1992.

Water supply withdrawals and diversions may cause serious damage to rivers and other water-dependent ecosystems. Further water resource development is often avoidable through efficiency improvements in water delivery and use. Therefore, efficiency improvements should be given a clear priority over new source development in water supply planning as the preferred alternative for closing a current or potential gap between water demands and existing supplies. This essay discusses the reasons supporting such a preference, including cost savings, energy savings, water quality benefits and increased protection of water levels needed to maintain the integrity of fisheries and other water-dependent organisms and ecosystems.

A major objective of water supply planning is to help communities avoid current or potential water shortages. Water shortages typically occur during drought periods, when demand tends to be higher (primarily due to an increase in outdoor watering) and supplies tend to be scarcer (primarily due to lower reservoir and water table heights and reduced streamflows). Water supply plans for river basins in Massachusetts (henceforth referred to as river basin plans) utilize a hypothetical drought of a severity that would occur on the average of once in a twenty year period as a means of testing a community's likelihood of experiencing a significant gap between water supply and demand.

Previous river basin plans have typically recommended various kinds of **new source development** (usually in the form of more water supply wells) as the primary means to help communities get through drought periods and other water supply shortfalls (provided that the state determines that additional water is hydrologically available within the basin/subbasin). Why is this a problem? The problem is that **new source development is likely to be more environmentally harmful (and often more costly) than alternative methods of closing the gap between water demand and supply**.

Withdrawals, diversions and other artificially-induced reductions in water levels in rivers, streams, kettle ponds, wetlands and other hydric ecosystems have the potential for causing serious ecological damage, especially during drought periods. Why is this the case?

Water is an essential component of aquatic and other water-dependent ecosystems such as wetlands. The presence of water in sufficient amounts and periods of time is crucial to the continued survival of many plants and animals in these areas. Removal of water from these areas can cause significant environmental damage, depending upon the time, location and amount of the withdrawal and the sensitivity of the affected areas.

Droughts and other low-water events are especially stressful times for fish and other water-dependent organisms. Most of these species have evolved to withstand a certain level of stress resulting from naturally-occurring drought periods. **Water withdrawals and diversions for water supply or other purposes, however, can significantly increase the duration, frequency and severity of drought conditions**. This artificially-induced drop in water levels may lead to a marked decline in the quality and quantity of habitat for water-dependent species in rivers, streams, wetlands and other hydric ecosystems. Such an impact is likely to result in the demise of sensitive (and often the most ecologically significant) species and a drop in overall species diversity, a key indicator of ecological health. This problem is further aggravated by the fact that new diversions or withdrawal points are often proposed to be located within the shrinking inventory of relatively unspoiled and uncontaminated areas which possess high ecological values and sensitivities.

Increasing levels of out-of-stream water use (and any additional withdrawals and diversions developed in response to the increase) can have a negative impact on water **quality** of rivers in at least three ways. First, consumptive water supply withdrawals from wells near rivers can reduce the flow in rivers either by sucking water directly out of the river, intercepting groundwater that would have otherwise ended up in the river, or both. Less water in the river reduces its capacity for assimilating its load of point and nonpoint source pollution (i.e., levels of pollutant concentration will increase). Second, water that is used out-of-stream and is then returned to the river (through treatment plants, septic tanks, etc.) is usually poorer in quality than when it was originally withdrawn, also leading to an overall decrease in water quality. Third, the increased flow to wastewater treatment plants resulting from increasing levels of water use makes it harder for those plants to treat the influent effectively (i.e., increased flows can exceed the plants capacity and increase the likelihood of combined sewer overflows).

In summary, water resources development can cause serious environmental consequences, especially during low-water periods. This is why the typical pattern in river basin plans of recommending additional water withdrawals to help communities get through drought periods seems so inappropriate. Low-water periods are usually the worst times for water-dependent ecosystems to suffer additional water withdrawals. Yet the environmental cost of additional withdrawals is largely if not totally **avoidable** in many situations. Most communities can do a much better job of delivering and using water in an efficient, cost-effective and environmentally responsible manner. **River basin plans must effectively persuade communities to turn to increased efficiency of water delivery and use as the first and best means to avoid water shortages.**

Improving the efficiency of water delivery to and use by consumers can often close the gap between demand and existing supplies at a fraction of the cost of developing new sources. Efficiency improvements in water supply/use also bring with them a multitude of environmental benefits, including an enhanced ability to effectively treat wastewater and to retain water in the natural environment to perform its vital ecological functions. We need to keep in mind that whereas human communities can (and **should**) compensate for water shortages through more efficient use, the needs of natural communities are less flexible.

We must also not forget the strong likelihood that **existing** water withdrawals and diversions are **already** aggravating levels of environmental degradation caused by the lack of water in water-dependent ecosystems, especially during drought events. [Many of us witnessed this first-hand last July, when a number of rivers, streams and ponds across the state ceased flowing and/or dried up completely, often in the vicinity of water supply wells.] We must do what we can to identify places and times where existing water withdrawals and diversions are causing significant environmental harm, and then take action to adjust pumping times, rates and locations of withdrawal/diversion points to minimize this impact wherever possible. We should use river basin plans and all other available opportunities to educate water suppliers, communities and the public of the fundamental importance of water and the threats posed by withdrawals and diversions to our ecological well-being.

Increased efficiency should reduce communities' overall need for raw water inputs into their treatment and delivery systems, allowing them to **reduce existing** withdrawals and diversions and enabling aquatic ecosystems to recover from past degradation. Convincing communities to avoid new source development also saves them the time and expense of preparing and the state's time and expense of conducting environmental reviews of new source development. Last but not least, refraining from consumptive withdrawals and diversions to solve a demand-supply gap will help communities avoid the wrath of the increasing number of environmental organizations concerned about the negative impacts of water resource development.

Furthermore, if it is drought periods we are particularly concerned with, then perhaps a more appropriate means of avoiding water shortfalls during that time than recommending new water resource development (as even a new source is going to have a reduced yield during a drought) is to develop **demand management** techniques that bring demand down during drought periods so that existing supplies are adequate. In other words, it doesn't even make **hydrological** sense to expect to find abundant new sources of water that are available during drought periods. We need to place an increased emphasis on **demand-focused drought contingency planning** as the most effective strategy for closing the gap between supply and demand during drought periods. This strategy makes particular sense in river basin planning, when we're looking at how to get communities through drought events that occur on the average of only **once** during a twenty year period.

If (and **only** if) it is determined that efficiency improvements and other demand management techniques (such as drought contingency planning) cannot in and of themselves eliminate anticipated gaps between water supply and demand, **and** alternative means of water supply augmentation (such as **water sharing** arrangements with other water suppliers) have been exhausted, only then is new source development an appropriate option. Proposed new withdrawal points and pumping patterns and volumes must then be closely scrutinized to ensure minimum impact to water-dependent organisms and ecosystems.

In conclusion:

- A current or potential gap between water demand and existing supplies can be closed by either or both of the following means:

• obtaining water from new sources; or
• through greater efficiencies in water delivery and use.

In general, efficiency improvements coupled with demand-oriented drought planning are a cheaper, more reliable and more environmentally beneficial means of alleviating water shortages than is new source development. (And, in the increasing number of basins and subbasins that are already hydrologically "tapped out", there **is no** new source option.) Therefore, **water supply plans should adopt a policy which gives the promotion of improved efficiency in water delivery and use a clear preference over expanding withdrawals and/or diversions** as the most desirable means to close a current or potential gap between demand and existing supplies. River basin plans should be redirected away from their current focus on identifying new sources of water for satisfying projected increases in demand and toward solving current or potential gaps between supply and legitimate need through improvements in efficiency and drought contingency planning based on demand management.